



THE DIFFERENCE OF NEUTROPHIL LYMPHOCYTE RATIO (NLR) IN CONVENTIONAL AND ELECTRIC SMOKERS

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ABSTRACT

Background: Smoking is an unhealthy lifestyle causing health problems that may lead to high morbidity and mortality rates. One way to stop smoking habit is by replacing conventional cigarettes with electric cigarettes. Cigarette smoke exposure can trigger an inflammatory reaction that can be measured using Neutrophil Lymphocyte Ratio (NLR). **Aim:** Proving of NLR in electric smoker are higher than conventional smoker. **Method:** The research used descriptive analytic design. The number of samples were 34 people, divided into 17 people each group (conventional smoker and electric smoker). The subjects were asked to fill out a questionnaire and their blood samples were taken by 3 cc. Then, the blood samples were tested in a laboratory to obtain NLR values. The data was then analyzed using unpaired T-test. **Result:** NLR mean in the conventional smoker group is $1,364 \pm 0,28$ and $1,791 \pm 0,49$ in the electric smoker group. The unpaired T-test indicates there is significant difference in the value of NLR between conventional smoker and electric smoker ($p=0,005$). **Conclusion:** NLR in electric smoker are higher than conventional smoke.

Keywords: Electric cigarettes, neutrophil lymphocyte ratio

BACKGROUND

The high number of smokers in the world, particularly in Indonesia, has received the attention of the government to be dealt immediately because of the impact caused by smoking for both active and passive cigarette users. In 2003, a Chinese discovered a way to help smokers quit smoking by replacing conventional cigarettes into electric cigarettes. Electric cigarettes are products that have procedure to change the substances contained in e-liquid into the form of steam and flow it into the lungs by using electric power. ⁽¹⁾

The beginning of the emergence of e-cigarettes that said it is safe for health because in general it only contains a mixture of propylene glycol, glycerin, nicotine, flavor enhancers. ⁽¹⁾ But, in current status-quo WHO does not recommend e-cigarettes because the research results show that e-cigarettes contain toxic Tobacco Specific Nitrosamines (TSNA) and carcinogenic

Diethylene Glycol (DEG). ⁽²⁾ However the use of e-cigarettes has increased. ⁽³⁾

Long-term exposed to cigarette smoke can trigger inflammation in the airways and lung parenchyma of smokers. ⁽⁴⁾ Exposure of cigarette smoke can cause an increase in the release of pro-inflammatory cytokines by epithelial cells which then affects the growth, differentiation and activation of leukocytes. This causes leukocytosis in smokers. ⁽⁵⁾

Whole blood cell count is one of the tests of a complete blood count. A complete blood count can be done if you have symptoms and signs related to an inflammatory condition. Neutrophil Lymphocyte Ratio (NLR) is a comparison of the number of absolute neutrophils and absolute lymphocytes obtained from peripheral blood samples. ⁽⁶⁾ NLR is one application of the WBC count that can be used as an inflammatory marker. ⁽⁷⁾



There is a link between the inflammatory process and smoking behavior, it is necessary to find data to know an illustration of the inflammatory process in smokers, in this case on the subject to be routinely tested for blood. This study will examine the differences of NLR in the subject of conventional smokers and electric smokers.

METHOD

The research method used descriptive analytic design. Research subjects consisted of 34 Diponegoro University students with male, aged 18-25 years who were conventional active smokers or electric smokers, did not suffer from ARI and infection, did not suffer from chronic inflammatory diseases or psychological disorders, did not experience fever 37.5°C - 38.5°C at the time of sampling, and did not consume corticosteroid drugs, NSAIDs or undergo chemotherapy. Subjects were divided into two groups, which were the group of conventional smokers and electric smokers, each of which consisted of 17

people. Research carried out in the form of filling out questionnaires and taking blood specimens as much as 3cc to determine the value of NLR. Data was processed, coded, tabulated and entered into a computer for descriptive analysis and hypothesis testing. The normality of data distribution was analyzed using the Shapiro-Wilk test to compare data on conventional smokers and electric smokers. Differences in NLR values between groups were compared using the unpaired T-test.

RESEARCH RESULT

There were 34 research subjects that fulfilled the inclusion and exclusion criteria. All research subjects were Diponegoro University students between the ages of 18 and 25 years, male and smoking with conventional and electric cigarettes. Subjects were divided into two groups, which were the group of conventional smokers and electric smokers, each consisting of 17 people.

Table 1. Characteristics of Research Subjects

Characteristic	Group					
	Conventional Smokers			Electric Smokers		
	N	%	Mean \pm SD	N	%	Mean \pm SD
Age	-	-	21,41 \pm 0,79	-	-	19,94 \pm 1,39
Cigarette consumption in a week						
- Everyday	13	76,47 %	-	11	64,70 %	-
- 4-5 times a week	4	17,64 %	-	3	17,64 %	-
- 3-4 times a week	0	0,00 %	-	1	5,89 %	-
- 1-2 times a week	1	5,89 %	-	2	11,77 %	-
- <1 times a week	0	0,00 %	-	0	0,00 %	-
Cigarette consumption in a day						
- Light	12	70,59 %	-	8	47,06 %	-
- Moderate	5	29,41 %	-	-	-	-
- Severe	0	0,00 %	-	9	52,94 %	-
Leukocytes	-	-	7055 \pm 415	-	-	7954 \pm 1230



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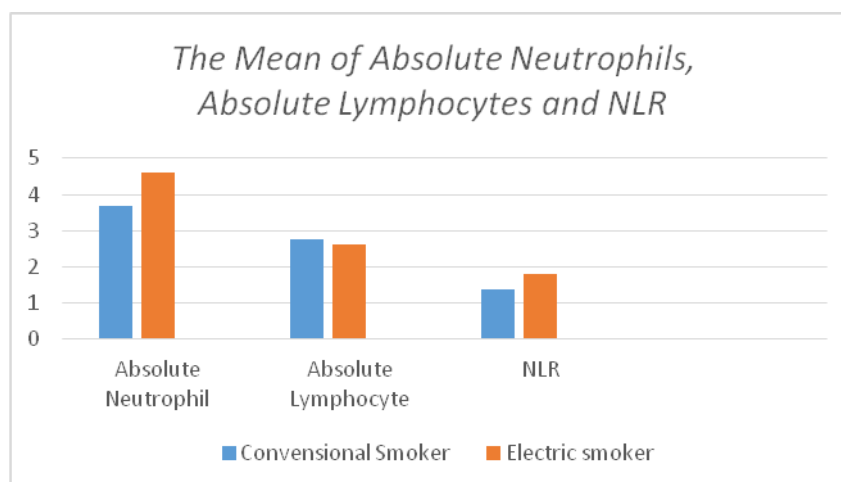
- Eosinophils	-	-	139 ± 83	-	-	203 ± 181
- Basophils	-	-	0	-	-	0
- Neutrophils	-	-	3675 ± 394	-	-	4590 ± 1177
- Lymphocytes	-	-	2765 ± 400	-	-	2604 ± 327
- Monocytes	-	-	474 ± 87	-	-	577 ± 155
NLR	-	-	1,364 ± 0,28	-	-	1,791 ± 0,49

In the research, it was found that the mean NLR in the conventional smokers group was 1.364 ± 0.28 and in the group of electric smokers with the mean of 1.791 ± 0.49 .

Table 2. The mean of Absolute Neutrophils, Absolute Lymphocytes and NLR

No		Mean ± SD		
		Conventional Smokers	Electric Smokers	
1.	Absolute Neutrophils	3675 ± 394	4590 ± 1177	-
2.	Absolute Lymphocytes	2765 ± 400	2604 ± 327	-
3.	NLR	1,364 ± 0,28	1,791 ± 0,49	p=0,097

* Shapiro-Wilk normality test has meaning if $p > 0,05$



Picture 1. The Mean of Absolute Neutrophils, Absolute Lymphocytes, NLR

Homogeneity test results of data variants using the Levene test showed that the data obtained had a value of $p = 0.022$, then the variance of the data was different. For the results of tests using the unpaired T-test showed a value of $p = 0.005$, then there was a statistically significant difference in mean NLR values between the conventional smoker group and the electric smoker group.

DISCUSSION

Based on statistical tests found that there were significant differences between the both of them. This shows that the inflammatory effect caused by the group of electric smokers is higher than the conventional group of smokers. This is due to the fact that e-cigarette smoke increases oxidative stress markers higher than with conventional cigarette smoke. The exposure of electric cigarette vapor triggers an



inflammatory response and affects the mechanics of the respiratory system, and the flavor enhancer of electric cigarette also exacerbates the adverse effects of electric cigarette vapor. (8)

Exposed to electric cigarette induces macrophages for phagocytosis and releases proinflammatory cytokines such as interleukin-6 (IL-6), interleukin-10 (IL-10). These cytokines cause differentiation of B cells and T cells. (9) The effect of cigarette smoke on B cells is suppressive. (4) Whereas IL-6 causes phosphorylation of STAT3 to remove neutrophils. So that it can make an increase in the value of NLR. (9)

Although the amount of harmful substances found in e-liquid is lower than conventional cigarettes, but the inflammation caused by e-cigarette smoke is higher than conventional cigarettes.

Another thing that can cause changes in the level of inflammation of research subjects is the subject's psychic, physical activity habits and sports.

When the subject is experiencing psychological stress, it can cause changes in the number of leukocytes, which can change the value of absolute neutrophils and absolute lymphocytes. CRP. (11)

Habits of physical activity and exercise can change the number of leukocytes and can reduce inflammation by triggering a systemic increase in the number of cytokines and chemokines that have anti-inflammatory properties. (12)

CONCLUSION AND SUGGESTIONS

Conclusion

NLR values in the group of electric smokers are higher than conventional smokers.

Suggestion

1. It is needed to have a further research about the differences in NLR in

- conventional smokers and electric smokers with more research subjects.
2. Further research needs to be conducted on the differences in NLR in varied conventional smokers and electric smokers with research subjects who have more characteristics of daily smoking consumption.

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